PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	Docket No: Q77958
Eric MONTFORT, et al.	
Appln. No.: 10/687,585	Group Art Unit: 3661
Confirmation No.: 2460	Examiner: Brian J. BROADHEAD
Filed: October 20, 2003	

For: A SYSTEM FOR CONTROLLING THE ATTITUDE OF A GEOSTATIONARY SATELLITE

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I. REAL PARTY IN INTEREST

The real party in interest is the Assignee, Alcatel, by virtue of an assignment recorded in the USPTO on February 26, 2004 at Reel 015014, Frame 0972.

II. RELATED APPEALS AND INTERFERENCES

There are no other prior or pending appeals or interferences known to the Appellants which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 4-16 are pending in the application and are the subject of this appeal.

Claims 1-3 have been previously canceled without prejudice or disclaimer, and are not the subject of this appeal.

IV. STATUS OF AMENDMENTS

Appellants filed an Amendment under 37 C.F.R. § 1.116 on May 7, 2007 in response to the Office Action dated February 6, 2007. On May 24, 2007, the Examiner issued an Advisory Action which indicated that in the event of an appeal, the claim amendments of May 7 would be entered. Accordingly, the claims stand as presented and amended in the May 7 Amendment.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention relates to an attitude control system for geostationary satellites and, particularly, geostationary satellites which include a plurality of elongated members. (*See* Abstract of the Disclosure). The present application teaches that when satellites have large appendages, such as elongated members, they may interfere with the attitude of the satellite. Particularly, the body of the satellite may be subjected to disturbing torques which are transmitted to the appendages and cause low frequency movements. (page 2, lines 33-35). The present application teaches that the attitude of satellites must be continuously controlled so that the antennas always retain a particular direction. (page 2, lines 13-15). In order to do so, the present application teaches an attitude control system (Fig. 3) which controls gyroscopic actuators 36 which supplies torque to the satellite in response to a disturbing force. Notably, the present application teaches that a corrector 50 of the loop 40 should include the lowest and most energetic frequencies of the flexible modes of the elongated member so that the gyroscopic actuators can oppose the oscillatory torques of the solar generator panels or antennas. (page 3, lines 29-35 and page 4, lines 11-17).

With reference to claim 4, a non-limiting embodiment of the specification discloses an attitude control system for a geostationary satellite 10. The geostationary satellite 10 of the exemplary embodiment of the specification includes solar generators 12, 14 (elongated members). When a disturbing torque is exerted on the body 16 of the satellite, the lightweight

panels oscillate at a low frequency causing flexible mode deformation. (*see* page 5, lines 11-14). Fig. 2 shows a gyroscopic actuator and Fig. 3 schematically illustrates the attitude control system. The system includes gyroscopic actuators (Fig. 2 and block 36 in Fig. 3) for supplying the torque necessary for maintaining the attitude of the satellite when subjected to disturbing forces or torques. (*see* page 5, lines 18-31). The system also includes an attitude regulation loop 40 which includes a corrector 50 such that the bandwidth of the loop 40 contains the lowest and most energetic frequencies of the flexible modes of the elongated members. (*see* page 6, lines 1-15). The loop 40 provides a control signal to control the gyroscopic actuators 36. (*see* Fig. 3 and page 6, lines 3-5).

With reference to claim 8, a non-limiting embodiment of the specification discloses a satellite 10 with a plurality of solar generators 12, 14 (elongated deployable members) and an attitude control system. (see Figs. 1 and 3 and page 5, lines 9-14 and lines 32-33). The attitude control system, as shown in Fig. 3, comprises a gyroscopic actuator 36 that supplies torque to the satellite when the satellite is subjected to a disturbing force or a disturbing torque. (*see* Fig. 2 and page 5, lines 18-31). The attitude control system further comprises a control system that receives signals representing a current attitude of the satellite 10 and that controls the gyroscopic actuator 36 to supply a correction torque based on a difference between the current attitude of the satellite 10 and a predetermined set attitude for the satellite 10. (*see* page 5, line 32 to page 6, line 15). The gyroscopic actuator is one of a plurality of gyroscopic actuators, each gyroscopic actuator controlled by the control system to supply torque to maintain the predetermined set attitude of the satellite. (*see* page 5, lines 18-21). Also, the control system comprises an attitude

regulation loop 40, including a corrector 50 such that the bandwidth of the loop 40 contains the lowest and most energetic frequencies of flexible modes of the elongated members 12, 14 and the attitude regulation loop 40 provides a control signal to control the gyroscopic actuators 36. (*see* page 5, lines 1-15).

As shown in Fig. 1, the solar generators 12, 14 have a fixed length.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Ground 1

Claims 15 and 16 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Ground 2

Claims 8, 10, 12 and 13 remain rejected under 35 U.S.C. § 102(b) as being anticipated by Heiberg (U.S. Patent No. 5,944,761).

Ground 3

Claims 4, 6 and 14-16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Heiberg.

Ground 4

Claims 5, 7, 9 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Heiberg in view of Parvez et al. (U.S. Patent No. 6,089,507).

VII. ARGUMENT

Claims 4-16 are pending in the application. Claims 4 and 8 are independent claims. Claims 5-7 and 15 depend from claim 4 and claims 9-14 and 16 depend from claim 8.

Ground 1

Claims 15 and 16 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner asserts that there is no mention of the length of the elongated members in the original disclosure. Appellants respectfully traverse.

The non-limiting embodiment of the specification shown in Fig. 1 discloses that the solar generators 12 and 14 (elongated members) are fixed lengths. Also, one of ordinary skill in the art would understand that the solar generators and/or antennas described in the present application are a fixed length. There is no description in Appellants' disclosure that the members are variable and the figures represent fixed lengths. Accordingly, Appellants submit that claims 15 and 16 comply with the written description requirement and respectfully request that this rejection be withdrawn.

Ground 2

Claims 8, 10, 12 and 13 are rejected under 35 U.S.C. § 102(b) as being anticipated by Heiberg (U.S. Patent No. 5,944,761). Claim 8 is an independent claim and claims 10, 12 and 13 depend from claim 8. Appellants respectfully traverse.

Claim 8 recites "a corrector such that the bandwidth of the loop contains the lowest and most energetic frequencies of flexible modes of the elongated members". As discussed in the

specification of the present application, an exemplary embodiment of a corrector so designed can stabilize the system by having the gyroscopic actuators oppose the oscillatory torques of solar generator panels or antennas. (page 3, lines 29-35; also, note that this section refers to the present invention - *see* page 3, lines 10-13).

The Examiner asserts that Heiberg discloses a satellite as recited in claim 8. Particularly, in the Final Office Action dated February 6, 2007, the Examiner asserts that Heiberg Fig. 1 discloses a satellite as recited in claim 8 including a corrector such that the bandwidth of the loop contains the lowest and most energetic frequencies of flexible modes of the elongated members. However, Heiberg does not discuss the lowest and most energetic frequencies of flexible modes of the elongated members at all. Nor does the Examiner assert that Heiberg specifically provides any teaching regarding the lowest frequencies, let alone that the corrector is such that the bandwidth of the loop contains the lowest and most energetic frequencies as claimed. Instead, the Examiner asserts that "[s]ince the system discloses controlling vibration from solar panels it must inherently have a bandwidth that contains the lowest and most energetic frequencies of the elongated members." However, there is no support for the Examiner's assertion that Heiberg must **inherently** include the claimed feature.

Initially, there is no indication that Heiberg teaches an attitude regulation loop which includes the lowest and most energetic frequencies. Particularly, neither the embodiment of Fig. 1 (with disturbance $w_{(s)}$) nor the embodiment of Fig. 2 (with disturbance frequency ω_d) teach a loop with the lowest and most energetic frequencies. In fact, the entire Heiberg reference does not teach anything regarding the bandwidth of a loop containing the lowest and most energetic

frequencies of the flexible modes. Instead, Heiberg is concerned only with dealing with vibrations which change frequency with time, in contrast to Appellant's claimed invention for correcting the lowest and most energetic frequencies, which are absolute and do not vary with time.

Indeed, the Examiner's assertion that the Heiberg system "must inherently" have a bandwidth that contains the lowest and most energetic frequencies is not only unsupported in the disclosure, but is actually contradicted by the Fig. 2, element 116 and the accompanying description in the specification. Fig. 2 illustrates essentially a single frequency of interest, ωd, the peak in Fig. 2, which is the "frequency of the disturbance" (column 3, line 25). However, Fig. 2 also shows that this frequency ωd is not the lowest frequency. Instead, Fig. 2 shows frequencies which are lower than the frequency of the disturbance ωd with which Heiberg Fig. 2 is concerned. Therefore, it cannot be inferred that the control loop bandwidth "must inherently" contain the lowest and most energetic frequencies as claimed. As shown in Fig. 2, Heiberg only discloses that the control loop would include the frequency ωd, which does not include the lowest and most energetic frequency. Since Heiberg explicitly shows a frequency other than the lowest and most energetic, it clearly does not inherently have the lowest and most energetic frequency.

Furthermore, even if Heiberg did not explicitly show a frequency other than the lowest and most energetic, it still would not be inherent that Heiberg have an attitude regulation loop having a bandwidth containing the lowest and most energetic frequencies. The doctrine of inherency allows for "modest flexibility in the rule that 'anticipation' requires that every element

of the claims appear in a single reference." *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1269 (Fed. Cir. 1991). "It is not, however, a substitute for determination of patentability in terms of § 103." *Id.* Although extrinsic evidence may be consulted regarding an asserted inherent characteristic, "[s]uch evidence must make clear that the missing descriptive matter is *necessarily* present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Id.* at 1268 (emphasis added). Moreover, inherency "may not be established by probabilities or possibilities." *Id.* at 1269. "The mere fact that a certain thing may result from a given set of circumstances is not sufficient," and expert testimony cannot be used to fill in the evidentiary gaps of an otherwise lacking prior art reference. *Motorola Inc. v. Interdigital Technology Corp.*, 121 F.3d 1461, 1473 (Fed. Cir. 1997), citing *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554 (Fed. Cir. 1983) (reversing trial court's judgment of invalidity because expert's testimony of inherent anticipation, unsupported by the evidentiary record, cannot serve as a basis for a finding of anticipation).

If a structure in a cited reference does not expressly disclose a claimed feature, but absolutely must include that claimed feature in order to function properly, then that feature is deemed to be inherently disclosed. *See, e.g., W.L. Gore*, 721 F.2d at 1554 ("[W]e are not persuaded that the "effect" of the processes disclosed in Smith and Sumitomo, an "effect" undisclosed in those patents, would be *always* to inherently produce or be seen always to produce products meeting all of the claim limitations.") In other words, if there are two or more possibilities with respect to the non-disclosed feature, then the non-disclosed feature is not inherent.

As established in the case law discussed above, the reference can only be treated as inherently including a feature if it **absolutely must** have the claimed feature. If there are two or more possibilities with respect to the non-disclosed feature, then the non-disclosed feature is not inherent. In this case, Heiberg does not inherently have to include the claimed feature of "a corrector such that the bandwidth of the loop contains the lowest and most energetic frequencies of flexible modes of the elongated members". Particularly, the Heiberg bandwidth may contain other frequencies and not the lowest and most energetic frequencies. This is certainly a possibility and the Examiner has provided no reason why this is not a possibility. In addition to Heiberg's own disclosure of another frequency, the Markley reference ("Attitude Control System Conceptual Design for Geostationary Operational Environmental Satellite Spacecraft Series") previously applied by the Examiner indicates that not including the lowest and most energetic frequencies is a possibility. The Markley reference teaches a bandwidth in which the lowest and most energetic frequencies are avoided. The Markley reference was discussed on pages 6 and 7 of Appellant's Amendment filed March 9, 2006. The Markley reference is clear evidence that the use of a bandwidth without the lowest and most energetic frequencies is not inherent and that it is possible to not include these frequencies.

The present application recognizes the importance of the lowest and most energetic frequencies. Accordingly, the claimed invention includes a corrector such that the bandwidth of the loop contains the lowest and most energetic frequencies. Heiberg does not disclose anything about the lowest and most energetic frequencies and includes no discussion of their importance.

Without recognition of the importance of these frequencies, it may simply include a bandwidth with higher frequencies.

In view of the above, Appellants respectfully submit that claims 8, 10, 12 and 13 are allowable over Heiberg and respectfully request that the Examiner's rejection be reversed.

Ground 3

Claims 4, 6 and 14-16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Heiberg. Appellants respectfully traverse.

Claim 4 is allowable at least for reasons similar to claim 8. Particularly, claim 4 recites "a corrector such that the bandwidth of said loop contains the lowest and most energetic frequencies of the flexible modes of said elongated members". As discussed above, Hieberg does not disclose such a corrector. Accordingly, claim 4 is allowable over Heiberg. Also, claims 6 and 15 depend from claim 4 and claims 14 and 16 depend from independent claim 8. Accordingly, claims 6 and 14-16 are allowable at least by virtue of their respective dependencies.

Ground 4

Claims 5, 7, 9 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Heiberg in view of Parvez et al. (U.S. Patent No. 6,089,507). Claims 5 and 7 depend from claim 4 and claims 9 and 11 depend from claim 8. Parvez does not correct the above-noted deficiencies of Heiberg with respect to claims 4 and 8. Accordingly, claims 5, 7, 9 and 11 are allowable at least by virtue of their respective dependencies.

VIII. CONCLUSORY REMARKS

For at least the reasons set forth above, Appellants submit that the outstanding rejections are in error and reversal is respectfully requested.

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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CLAIMS APPENDIX

CLAIMS 4-16 ON APPEAL:

4. An attitude control system for a geostationary satellite including a plurality of elongated members, which system includes gyroscopic actuators for supplying the torque necessary for maintaining the attitude of said satellite when subjected to disturbing forces or torques and further including an attitude regulation loop including a corrector such that the bandwidth of said loop contains the lowest and most energetic frequencies of the flexible modes of said elongated members, wherein the attitude regulation loop provides a control signal to control the gyroscopic actuators.

5. The system claimed in claim 4 wherein said corrector is a proportional, integral, derivative corrector and is associated with an attenuation filter.

6. The system claimed in claim 4 wherein said corrector of said loop is synthesized by means of advanced system control methods.

7. The system claimed in claim 6 wherein said advanced system control methods is one of H∞ and Linear Matrix Inequality methods.

8. A satellite, comprising:

a plurality of elongated deployable members; and

an attitude control system, comprising:

a gyroscopic actuator that supplies torque to the satellite when the satellite is subjected to a disturbing force or a disturbing torque; and

a control system that receives signals representing a current attitude of the satellite and that controls the gyroscopic actuator to supply a correction torque based on a difference between the current attitude of the satellite and a predetermined set attitude for the satellite;

wherein the gyroscopic actuator is one of a plurality of gyroscopic actuators, each gyroscopic actuator controlled by the control system to supply torque to maintain the predetermined set attitude of the satellite; and

wherein the control system comprises an attitude regulation loop, including a corrector such that the bandwidth of the loop contains the lowest and most energetic frequencies of flexible modes of the elongated members and the attitude regulation loop provides a control signal to control the gyroscopic actuators.

9. The satellite of claim 8, wherein the corrector is a proportional, integral, derivative corrector and is associated with an attenuation filter.

10. The satellite of claim 8, wherein the corrector of the loop is synthesized by means of advanced system control methods.

11. The satellite of claim 10, wherein the advanced system control methods are one of H∞ and Linear Matrix Inequality methods.

12. The satellite of claim 8, wherein each of the gyroscopic actuators comprises a flywheel having a rotation axis, and wherein the control system varies a direction of one or more of the rotation axes, thereby applying torque to the satellite to maintain the predetermined set attitude of the satellite.

13. The satellite of claim 12, wherein the necessary torque for maintaining the predetermined set attitude is based on the precession tendency of one or more of the gyroscopes.

14. The satellite of claim 8, wherein the satellite is a geostationary satellite.

15. The system claimed in claim 4 wherein the elongated members have a fixed length.

16. The satellite of claim 8, wherein the elongated members have a fixed length.

EVIDENCE APPENDIX:

NONE

RELATED PROCEEDINGS APPENDIX

NONE